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TO SEAWEED COLLECTORS.

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Among the great number of persons, who, within the next three months, will make a longer or shorter stay at points on the New England coast, there are undoubtedly many who have seen and admired collections of algae, and have hoped, when they had the opportunity, to make a collection for themselves. But it is probable that without some advice as to where and how to collect, and how to determine the plants collected, in most cases little will be accomplished. With a view to giving some little assistance in these matters, the writer would call attention, first, to the books in which our New England seaweeds are described; second, to some of the richer and more interesting localities; and third, to some species, which are known only from one, or at most two localities, and in regard to which any further information would be a real addition to our knowledge.

The first great contribution to the literature of American algology, and the foundation for all subsequent work, is the Nereis Boreali-Americana of W. H. Harvey, published in three parts in the Smithsonian Contributions to Knowledge for the years, 1852, 1853 and 1857. It is a quarto, with fifty colored plates, and covers all the species known, at the time of its issue, to occur in the United States. Though the government supply was long since exhausted, a copy can frequently be obtained from the dealers who make a specialty of botanical works.

The next work of importance is the Manual of the Marine Algae of New England, by W. G. Farlow, originally published as a supplement to the Report of the United States Fish Commission for 1879, and as a separate work in 1881. It bears the same relation to the New England marine flora that Gray's Manual does to the flowering plants of

the eastern States, and is absolutely necessary for any thorough study. A more popular book, published in the same year, is Sea Mosses, by A. B. Hervey; many of our more conspicuous algae can easily be recognized by it, but it does not attempt to give the rarer species. In the eighteen years since these two books were published, there has been a long list of additions to the marine flora of this region; the larger part of the species are insignificant in appearance or quite microscopical, but there is also a number of more conspicuous forms. These additions will be found in notes published by Professor Farlow and by the writer, in the Bulletin of the Torrey Botanical Club.[1] This practically completes the list of available publications, except as algae are included with other plants in local floras.[2]

It seems hardly necessary to give detailed instructions as to collection and preparation of specimens, as each of the three authors first mentioned, Harvey, Farlow and Hervey, gives these quite fully in the works cited. The same information may be found in The Botanical Collector's Handbook, by W. W. Bailey; and in Erythea for March, 1899, Vol. VII, Prof. W. A. Setchell has published a most useful paper, especially intended for Californian collectors, but of value in all regions. A few concise general notes may, however, not be out of place here.

Collect as perfect specimens as possible; when the plant is found growing, retain the "holdfast" by which it is attached. Whenever practicable, collect specimens in fruit. Avoid immature, mutilated and decaying individuals; though when a plant is new or very rare, any specimen is better than none. Mount as soon as possible after collecting, and always keep in salt water; many species spoil in a very short time, and fresh water is sometimes instant ruin.

When ready to mount, float out the specimens in some large vessel of clean salt water; remove any dirt or foreign bodies; when the plant is too densely branched, trim as needed. Let the specimen assume its natural form in the water; if fresh it will do so readily; slide under it a paper of suitable size, lift so that when taken from the water the

1 Vol. IX, pp. 67 and 69, 1882; Vol. X, p. 55, 1883; Vol. XI, pp. 29 and 130, 1884; Vol. XVI, p. 1, 1889; Vol. XVIII, p. 335, 1891; Vol. XXIII, pp. 1 and 458, 1896.

2 The more important of these are, M. L. Owen, Flora of Nantucket, 1888; Dame & Collins, Flora of Middlesex County, Mass., 1888; Rand & Redfield, Flora of Mount Desert Island, Maine, 1894.

plant will remain on it, in the same shape it had in the water. Place the paper on a sloping board to drain for a short time; then lay on drying paper, specimen up; when no more specimens can be placed on the drier, cover all very carefully with a cotton cloth of the same size as the drier. Another drier, more specimens, another cloth, and so on indefinitely.

The whole then to be pressed, the same as flowering plants. Driers should be changed after perhaps an hour; then less and less frequently, though oftener than is usual with flowering plants. Cloths should not usually be changed; by reversing the pile, the cloth with all the specimens on it can be readily shifted. Drying paper to be the same as used for flowering plants, the heavier the better; for delicate algae heavy blotting paper is rather better, but more expensive. For mounting paper any sufficiently strong kind can be used; standard herbarium paper is excellent; it can be bought ready cut, in full sheets, half, quarter and eighth sizes, which give all usually needed. Ordinary cotton cloth, preferably rather fine, should be used; old is better than new; worn sheets and pillow-cases are as good as anything that can be had.

When thoroughly dry, most species of algae will adhere firmly to paper; those that continue unattached should be fastened by a little glue.

A special shallow pan, with sheet of perforated zinc for supporting paper and specimen; brushes and needles for arranging the latter (in emergency a hairpin is useful); a water-proof bag hung by a strap over the shoulder; wide-mouth bottles or preserve jars for keeping delicate plants; knives; scrapers; nets; all these are convenient, and will be found described, with other appliances, in the books just named; and any collector will soon invent or adapt such contrivances as best meet his wants.

In taking up the second subject, that of special localities, if we begin at the New York and Connecticut line, we find a shore of sand, gravel and boulders, but no rocky coast. This character continues over practically the whole coast of the mainland till we reach Cohasset, Mass. Almost everywhere in Long Island Sound, plants grow from low-water mark down; great quantities are sometimes washed ashore by a storm, and in any case when an annual matures, it can be found floating. By wading in shallow bays and lagoons, one can get such plants as *Agardhiella tenera*, *Gracilaria multipartita*, and several

species of *Polysiphonia* growing in great quantity and size in summer. The woodwork of the wharves from low water-mark down is often very rich in species and individuals. Harbors like those of Bridgeport and New Haven are excellent hunting grounds; if the former city seems to have the richest flora of all Long Island Sound, it is probably only that it has been so thoroughly studied. Between Bridgeport and New Haven, at Woodmont, is a small rocky ledge, the only point for many miles where collecting in rocky tide pools is practicable.

Though the sandy or gravelly shore continues practically to Boston on the mainland, the island of Rhode Island gives us very different conditions. Bold or overhanging rocks rise from the sea level, often with a sort of terrace at the base, covered at high water, but easily accessible at low tide, and with innumerable rock pools. Newport is perhaps the best collecting ground of all our coast; it has the warm-water flora of southern New England, with every variety of station; salt marsh, lagoon, sandy beach, boulders, steep cliffs, and tide pools at all levels. At the same time there is such an exposure to the full force of the open sea, that even such northern forms as *Laminaria longicruris* and *Alaria esculenta* occasionally are found.

For plants washed ashore, Bathing Beach and Second Beach are excellent localities, and on the island of Conanicut, Mackerel Cove. The tide pools at Sachuest and Easton's Points, below the Cliff Walk, and from there round to the South Shore, give good results; but perhaps the best pools of all are at Beaver Tail, at the south end of Conanicut. It would be hard to imagine a more beautiful sight than the acres of pools here in April and May, with the delicate green *Monostroma pulchrum*, the rich red *Gloiosiphonia capillaris*, the pale olive fronds of young *Laminaria*, and the iridescent *Chondrus*. As the season goes on other species take the places of these, but the rich display continues.

Vineyard Sound is in many ways like Long Island Sound, but a number of new species appear. At Gay Head there is almost always a sea on, and interesting deep-water plants are washed up. Wood's Hole has long been a centre of exploration, but probably is no richer than the Vineyard shore, especially Edgartown harbor, which is good collecting ground at all seasons of the year. The outside of Cape Cod, owing to the shifting sands, is quite barren; the shallow water inside is like Long Island Sound; at Cohasset begins the rocky coast that stretches, with little break, to New Brunswick. In the warm bays at

Quincy and Weymouth we again meet the southern flora, *Grinnellia* and *Dasya* often appearing in summer in the greatest luxuriance. Goose Cove, Gloucester, appears to be the last important outpost of the southern forms, and only comparatively few species reach there.

Nahant is the best known and most easily accessible part of the rocky shore near Boston. At the east end of Little Nahant, at Spouting Horn and at East Point, are abundant pools, similar to those at Newport, but with the northern flora. Swampscott and Marblehead Neck are similar, though hardly so well situated. All Cape Ann is a good region, but at Magnolia Beach many things come ashore, including perhaps the finest *Euthora cristata* found anywhere; and Pigeon Cove has an exposed rocky coast like that of Maine. North of Cape Ann are alternations of sandy stretches, relatively barren, and rocky points, usually good.

Portland gives excellent opportunities for collecting; the outer sides of the islands, especially Peak's Island, are very fertile, as is also the Cape Elizabeth shore. As we go beyond Portland, there is a broader and broader zone of islands, while the mainland is so sheltered that many of the exposed shore plants are no longer to be found there, though abundant on the islands. Mount Desert, however, takes the full force of the sea, and from Seal Harbor to Bar Harbor, wherever the shore is accessible, good collecting can be done. The icy chill of the water here, even in summer, makes a contrast with the warm water of the Vineyard and Nantucket, and the contrast of the two floras is equally striking. Beyond Mount Desert very little collecting of algae has been done, but the flora is probably the same; Eastport, the boundary, is better known, and everything there is much the same as at Mount Desert.

In making up the list for the third part of this note, species of strictly local record, and of whose range more knowledge is desired, only species that might be noticed by the ordinary collector are included. There are many smaller species, of equal botanical interest, that need not be noted here. The following list gives, together with name of the species, the locality, the collectors on whose authority it is recorded, and occasionally some remark.

Antithamnion cruciatum var. *radicans* J. Ag. Wood's Hole, W. A. Setchell.

Arthrocladia villosa (Huds.) Duby. Falmouth, and the Vineyard shore opposite; not rare here in summer, but known on the American coast elsewhere only at North Carolina.

Brachytrichia Quoyii (Ag.) Bornet & Flahault. Only within a few miles of Wood's Hole, especially on the Buzzard's Bay side; probably not native; see Bulletin Torrey Bot. Club, Vol. XVII, p. 175, 1890.

Ceramium Capri-Cornu (Reinsch) Farlow. Bridgeport, Conn., Isaac Holden.

Ceramium pedicellatum J. Ag. Newport, R. I., Mrs. W. C. Simmons.

Derbesia vaucheriaeformis (Harv.) J. Ag. Wood's Hole, W. G. Farlow; Edgartown, M. W. Jernegan.

Dictyosiphon Chordaria Aresch. Newport, R. I., Mrs. W. C. Simmons.

Dictyosiphon Ekmani Aresch. Nahant, F. S. Collins.

Ectocarpus elegans Thuret. Edgartown, M. W. Jernegan.

Ectocarpus lutosus (Harv.) Wood's Hole, W. G. Farlow.

Ectocarpus ovatus Kjellman. Edgartown, Miss Colt and Miss Jernegan.

Elachista stellaris var. *Chordae* Aresch. Falmouth, Mass., F. S. Collins.

Enteromorpha cruciata Collins. Eagle Island, Penobscot Bay, Maine, F. S. Collins.

Enteromorpha torta (Mert.) Reinbold. Eagle Island, Penobscot Bay, Maine, F. S. Collins.

Griffithsia tenuis Ag. Nantucket, L. L. Dame; Waquoit Bay, Mass., F. S. Collins.

Gymnogongrus Griffithsiae (Turn.) Martius. Eastham, Mass., F. S. Collins.

Haplospora globosa Kjellman. Edgartown, Mass., J. D. King.

Isthmoplea sphaerophora (Harv.) Kjellman. Nahant, Mass., F. S. Collins. A station of perhaps five square meters, the only one known in America.

Kallymenia reniformis (Turn.) J. Ag. Revere Beach, Mass., F. S. Collins. Only two fronds.

Litosiphon pusillus Harv. Newport, R. I., Mrs. W. C. Simmons. Perhaps introduced.

Monostroma Groenlandicum, J. Ag. Common at Nahant and Swampscott, but not known elsewhere nearer than Greenland.

Monostroma Vahlii J. Ag. Mystic River marshes, Mass., F. S. Collins; locality now destroyed; occurs at Greenland.

Phaeosaccion Collinsii Farlow. Mystic River marshes and Nahant; also in Greenland.

Phyllitis zosteraefolia Reinke. Magnolia, Mass., Miss C. E. Clarke; also at Newfoundland.

Phyllophora rubens (Good. & Wood.) Grey. Newport, R. I., Mrs. W. C. Simmons. Only a single specimen, and that doubtful; not otherwise known in America; should be carefully looked for.

Polysiphonia vestita J. Ag. Martha's Vineyard, Miss Laura Jernegan. Only a few plants.

Porphyra coccinea, J. Ag. Hampton Beach, N. H., F. S. Collins. A single frond of *Desmarestia aculeata*, washed ashore, covered with the *Porphyra*; not otherwise known in America.

Scaphospora Kingii Farlow. Edgartown, J. D. King.

Sorocarpus uvaeformis Prings. Martha's Vineyard, Miss Colt.

Ulothrix collabens (Ag.) Thuret. Nahant and Swampscott, F. S. Collins.

The writer would be very glad to receive specimens of any of these species from localities other than those named, or, in the case of the rarer ones, from the same localities; and, in general, any species new to our limits, or from points beyond the previous range. As far as practicable, he will be pleased to assist correspondents in determining doubtful forms, with the usual understanding that a specimen of each may be retained, if desired.

Polyembryony in Opuntia vulgaris. — A phenomenon of much scientific interest, though of no great frequency, is polyembryony or the production of more than one embryo from a single seed. It occurs in *Opuntia vulgaris*, as described and figured in the Botanical Gazette for April, 1898. The material used in that study was, however, from plants long grown in a botanic garden, and the polyembryony has not yet been observed in plants growing in a wild state. It is possible, though unlikely, that wild plants are not polyembryonic, and it is desirable that observations upon the point be made in the field. As the species occurs in New England, some of our botanists may have opportunity to study it this summer. If polyembryonic specimens are found, they should be preserved, preferably in a two per cent solution of formaline. The polyembryony shows itself in two ways: — first, in the production of two or more perfect embryos, one usually much larger than the others, from a single seed; and second, in single embryos composed of two or more variously united, thus showing